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This report describes the assembly of an ultrafast laser system.

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Final Technical Report

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Internal Energy in Condensed Phase Reaction Dynamics

Description

This grant is a DURIP funded project that provided a portion of the funds to construct a laboratory for studying the ultrafast dynamics of molecules in condensed phases. The heart of the experimental apparatus is a pulsed Ti:sapphire laser producing 100 fs pulses. The goal of the work was to establish the laboratory and characterize the laser pulses for use in the experimental studies

Accomplishments

We have identified and brought to Madison two crucial components of this effort: a state of the art femtosecond laser system, and an experienced and able post-doctoral associate to make the experiments a reality. During the first several months of this grant, we identified the optimum system, a Ti:sapphire oscillator and regenerative amplifier system from Clark Instruments. We purchased the system, extensively remodelled a laboratory to accommodate it and installed it in August. We have completed the data acquisition system while characterizing the laser and optimizing its performance. We have built a frequency resolved optical gating system and measured the bandwidth and duration of the pulses from the Ti:sapphire laser.

Construction of the first of our optical parametric amplifiers to produce the wavelengths is our most recent accomplishment. The Ti:sapphire laser produces 100-fs, 700-μJ pulses at 800 nm that are near the Fourier transform limit. Generating a white light continuum and seeding an optical parametric amplifier (OPA) allows us to produce 1.2 μm pulses of 100 μJ energy, which we frequency double to create 600-nm pulses with 60 μJ of energy. Doubling that again provides 10 μJ of 300-nm light for use as probe light. These wavelengths allow us to try our first measurements very soon. We will also construct another OPA to have independently tunable sources of radiation.